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PREFACE

This conference is held every two years in Porto. The focus is on fundamental research and application areas in the field of the design and application of engineering materials, predominantly within the context of mechanical engineering applications such as automobile, railway, marine, aerospace, biomedical, pressure vessel technology, turbine technology, etc. This includes a wide range of materials engineering and technology, including metals, e.g., lightweight metallic materials, polymers, composites, and ceramics. Advanced applications would include manufacturing in the new or newer materials, testing methods, multi-scale experimental and computational aspects (e.g. micro- and nano-scale techniques).

The conference venue is the campus of the Faculty of Engineering of the University of Porto (FEUP), which offers excellent facilities for high quality scientific interactions. FEUP is located in the town of Porto in the Northern region of Portugal. Porto is a beautiful and lively city, steeped in history and rich in great experiences. With its magnificent location by the Atlantic coast, Porto is the city of the world famous Port Wine and the River Douro.

139 abstracts (109 oral and 30 posters) are presented in this book of abstracts, representing 23 countries. Portugal, Poland and Italy are the most represented countries. The themes treated are: Metals, Polymers, Ceramics, Composites, Joining, Design, Machining, Tribology, Smart Material Design, Additive Manufacturing, Advanced Discretization Techniques and Power generation. Composites and Joining represents 1/4 of the abstracts. These themes will also be treated in the form of themed special issues with full papers from the conference to be published in *Proceedings of the Institution of Mechanical Engineers, Part L: Journal of Materials: Design and Applications* (SAGE) and in a book of the book series *Advanced Structured Materials* (SPRINGER) (provided they meet the journals standard).

Chairman
Lucas F M da Silva

Departamento de Engenharia Mecânica, Faculdade de Engenharia da Universidade do Porto, Portugal

Mechanical Properties Comparison of Autochthonous Natural Fibers Reinforced Polyester Composites: Flax and Hemp

J. Rocha[1], J.E. Ribeiro[1,2], L. Queijo[1]

[1]Polytechnic Institute of Bragança, ESTIG, C. Sta. Apolónia, 5301-857 Bragança, PT.

[2] LAETA-INEGI, FEUP Campus, Dr. Roberto Frias Street, 400, 4200-465 Porto, PT.

Nowadays, the climate changing caused by the increasing of pollution and the need of reduce the carbon footprint brings the growing use of autochthonous materials. On the other hand, there are new European Community directives that require the increased use of recyclable materials and the natural fibres are excellent candidates for this role. However, only in last few years this subject has been studied for technical applications [1]. This work intends to add a small contribution to better characterize composites with some of these natural fibres. For that reason, is used the Taguchi method [2] to characterize composites of natural fibers, namely the hemp and flax fibres which will be used individually and mixed each other. The factors that will be controlled are, beyond the type of fibres, the interfacial strength, the humidity in the fibres and the fibre weight fraction. To implement the experimental tests will be used the method of design of experiments developed by Taguchi. In this case, is used the L_9 orthogonal array because is more suitable for the number of factors and levels analysed. So, for the interface strength improvement is used the alkali–silane treatment and are applied three different concentrations that are 0%, 2% and 5%. The humidity in the fibres is a very difficult parameter to control and for this reason will be used different ranges which will be obtained by controlling the drying time. Finally, will be used different values of fibre weight fraction to determine its influence in the tensile strength of the composite. Considering the number of factors to be controlled and the number of levels, the data that is analyzed is the tensile properties. The influence of each factor in the composite performance will determined using the analysis of variance (ANOVA) as well as the optimal factors and levels combination to obtain the highest values of tensile strength.

[1] K.L. Pickering, M.G. Efendy and T.M. Le, J. Comp. Part A, 83, 98 (2015).

[2] P. Ross, Taguchi Techniques for Quality Engineering, Edited by McGraw-Hill, New York, 1996.